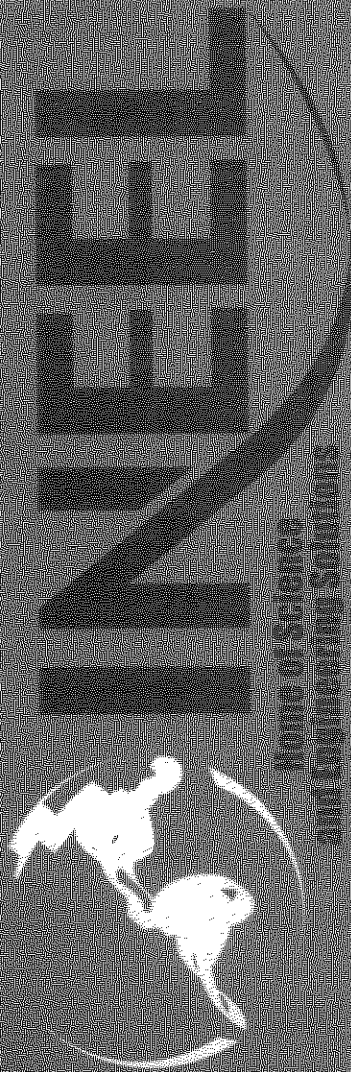


# ***Health and Safety Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer***

*March 2003*



*Idaho National Engineering and Environmental Laboratory  
Bechtel BWXT Idaho, LLC*

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**March 2003**

**Idaho National Engineering and Environmental Laboratory  
Bechtel BWXT Idaho, LLC  
Idaho Falls, Idaho 83415**

**Prepared for the  
U.S. Department of Energy  
Assistant Secretary for Environmental Management  
Under DOE Idaho Operations Office  
Contract DE-AC07-99ID13727**

## **ABSTRACT**

This Health and Safety Plan establishes procedures and requirements used to eliminate or minimize personnel health and safety risks while working on the Waste Area Group 3, Operable Unit 3-13, Group 5, Snake River Plain Aquifer Project, as required by the Occupational Safety and Health Administration standard “Hazardous Waste Operations and Emergency Response” (1910.120 and/or 1926.65). This document contains information about the hazards involved in performing the work as well as the specific actions and equipment used to protect personnel while working at the task site.

This plan has been prepared to comply with the authorized safety basis as detailed in the Idaho Nuclear Technology and Engineering Center authorized safety basis and hazard classification per the applicable preliminary hazard assessment, auditable safety analysis, or safety analysis report, if applicable. The Health and Safety Plan is intended to give safety and health professionals the flexibility to establish and modify project site safety and health procedures throughout the entire span of site operations based on the existing and anticipated hazards without modifying this document.



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## ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
ARDC	Administrative Record and Document Control
BBWI	Bechtel BWXT Idaho, LLC
CERCLA	Comprehensive Environmental, Response, Compensation and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
COC	contaminant of concern
CRC	contamination reduction corridor
CRZ	contamination reduction zone
CWA	controlled work area
DAC	derived air concentration
dBA	decibel A-weighted
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
EPA	Environmental Protection Agency
ERO	Emergency Response Organization
ES&H/QA	environment, safety, and health/quality assurance
EZ	exclusion zone
FFA/CO	Federal Facility Agreement and Consent Order
FS	feasibility study
FSP	Field Sampling Plan
FTL	field team leader
GI	gastrointestinal

HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HSO	health and safety officer
IH	industrial hygienist
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IRTL	incident response team leader
ISMS	Integrated Safety Management System
JSA	job safety analysis
JSS	job site supervisor
LEL	lower explosive limit
Lpm	liters per minute
LTMP	Long-Term Monitoring Plan
MCL	maximum contaminant level
mrem	millirem
NIOSH	National Institute of Occupational Safety and Health
NRTS	National Reactor Testing Station
OMP	Occupational Medical Program
OSHA	Occupational Safety and Health Administration
OU	operable unit
PEL	permissible exposure limit
PM	project manager
PPE	personal protective equipment
QAPjP	Quality Assurance Project Plan
RadCon	Radiological Control

RCIMS	Radiological Control and Information Management System
RCT	radiological control technician
RE	radiological engineer
REM	roentgen equivalent man
RI/BRA	remedial investigation/baseline risk assessment
ROD	Record of Decision
RWP	radiological work permit
SAM	Sample and Analysis Management
SAP	Sampling and Analysis Plan
SCBA	self-contained breathing apparatus
SE	safety engineer
SH&QA	safety, health, and quality assurance
SRPA	Snake River Plain Aquifer
STR	subcontractor technical representative
SWP	safe work permit
SZ	support zone
TLV	threshold limit value
TWA	time-weighted average
USGS	United States Geological Survey
UV	ultraviolet
VPP	Voluntary Protection Program
WAG	waste area group
WCC	Warning Communications Center



# **Health and Safety Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer**

## **1. INTRODUCTION**

This Health and Safety Plan (HASP) establishes the procedures and requirements used to minimize health and safety risks to persons working on the Operable Unit (OU) 3-13, Group 5, Snake River Plain Aquifer (SRPA) project at the Idaho National Engineering and Environmental Laboratory (INEEL).

### **1.1 Purpose**

This HASP meets the requirements of the Occupational Safety and Health Administration (OSHA) Standard, 29 Code of Federal Regulations (CFR) 1910.120 and CFR 1926.65, “Hazardous Waste Operations and Emergency Response” (HAZWOPER).

This HASP complies with the authorized safety basis detailed in INTECs authorized safety basis and “Other Industrial” classification per the applicable preliminary hazard assessment, auditable safety analysis, or safety analysis report, if applicable.

This HASP governs all work in support of the OU 3-13, Group 5, SRPA Project that is performed by the INEEL personnel and INEEL subcontractors, or employees of other companies. The HASP has been reviewed and revised by the project safety and health point of contact in conjunction with the project manager (PM), and the field team leader (FTL), or designee, to ensure the effectiveness and suitability of this HASP.

### **1.2 The Idaho National Engineering and Environmental Laboratory**

The INEEL, formerly the National Reactor Testing Station (NRTS), encompasses an area of 2,305 km<sup>2</sup> (890 mi<sup>2</sup>). It is located approximately 55 km (34 mi) west of Idaho Falls, Idaho (see Figure 1-1).

The United States Atomic Energy Commission, now the Department of Energy (DOE), established the NRTS, now the INEEL, in 1949 as a site for building and testing a variety of nuclear facilities. The INEEL has also been a storage facility for transuranic radionuclides and radioactive low-level waste since 1952. At present, the INEEL supports the engineering and operations efforts of DOE and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management technology development, and energy technology and conservation programs. The Department of Energy Idaho Operations Office (DOE-ID) has responsibility for the INEEL, and it designates authority to operate the INEEL to government contractors. BBWI, the current primary contractor for DOE-ID at the INEEL, provides managing and operating services to the majority of the INEEL facilities.

Because of soil and groundwater contamination resulting from past operations at the INEEL, it was placed on the National Priorities List in November 1989. A Federal Facility Agreement and Consent Order (FFA/CO) was negotiated and signed on December 9, 1991, with Environmental Protection Agency (EPA) and the Idaho Department of Health and Welfare to direct the cleanup activities at the INEEL (DOE-ID 1991). To facilitate management of the cleanup, the INEEL was subdivided into 10 waste area groups (WAGs). This HASP specifically addresses work to be performed at the Idaho Nuclear Technology and Engineering Center (INTEC), a facility within INEEL. The INTEC is designated as WAG 3.

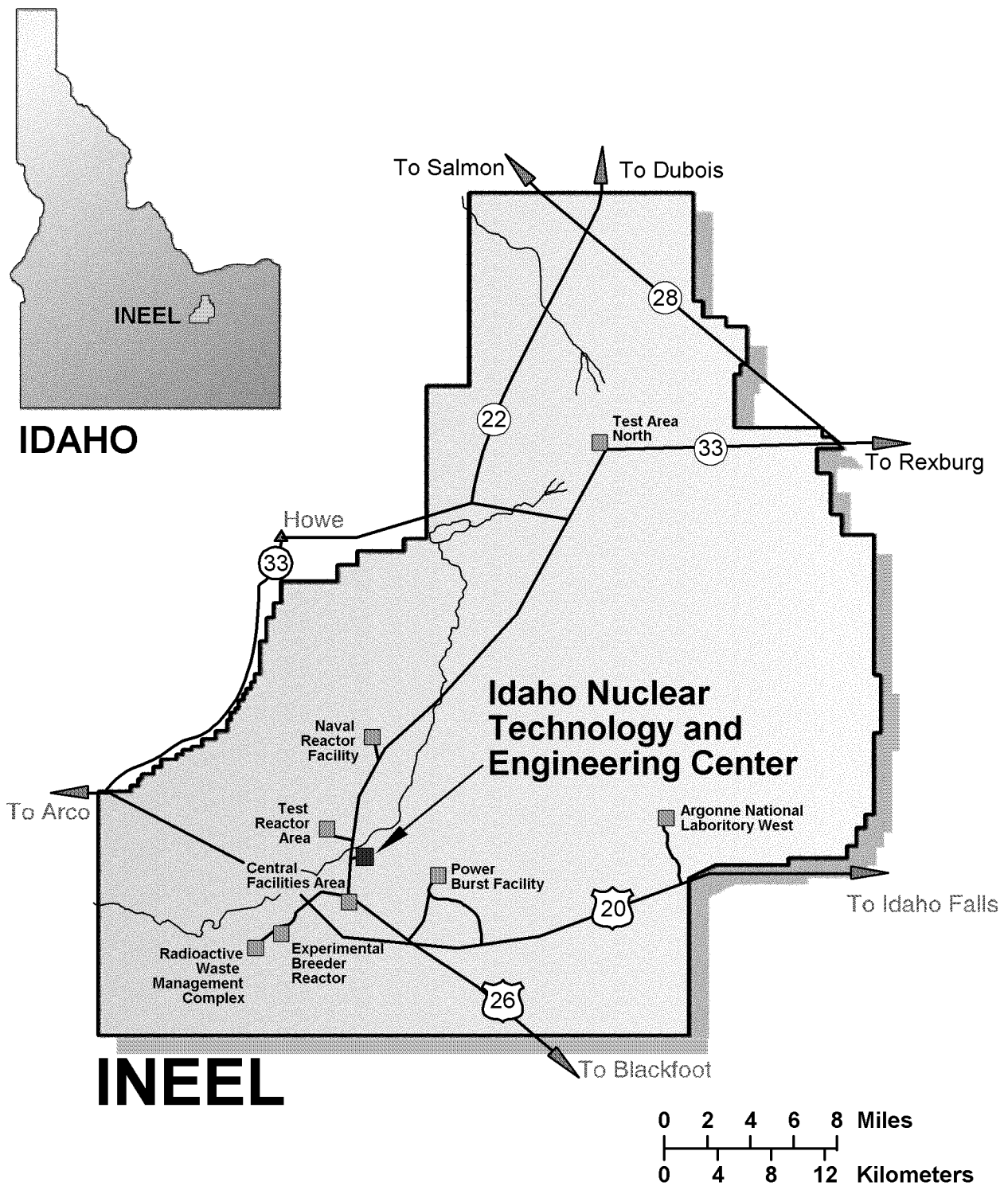


Figure 1-1. Map showing location of INTEC at the INEEL.

### **1.3 INTEC Site Description**

The INTEC, previously named the Idaho Chemical Processing Plant, has been in operation since 1954. The INTEC has historically been a uranium reprocessing facility for defense projects and for research and storage of spent nuclear fuel. In 1992, the DOE phased out the reprocessing operations and rescoped the mission to (1) receive and temporarily store spent nuclear fuel and other radioactive wastes for future disposition, (2) manage waste, and (3) perform remedial actions. Figure 1-1 identifies the location of INTEC at the INEEL.

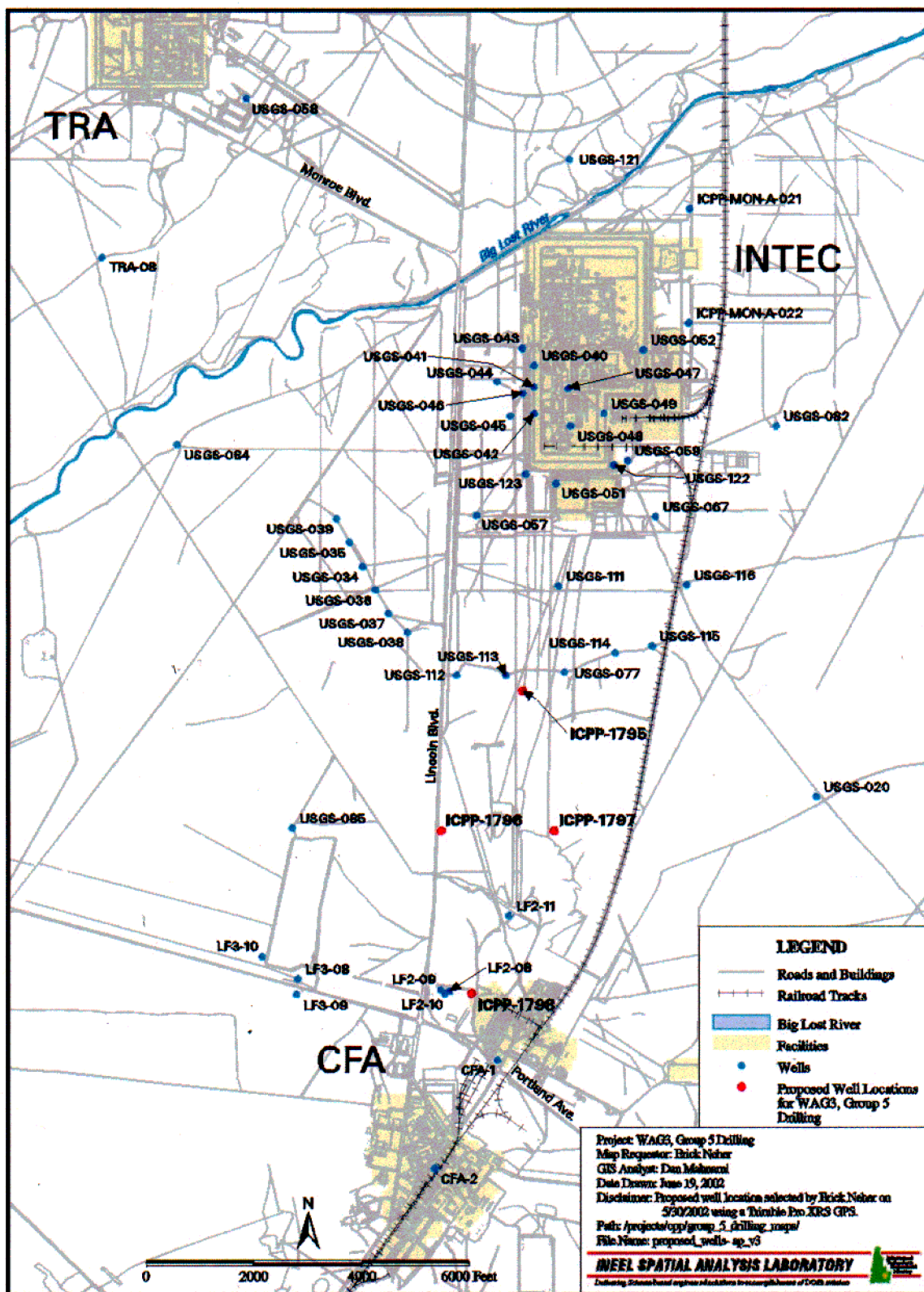
A comprehensive operable unit, OU 3-13, was established to provide an overall evaluation of previously identified release sites at the INTEC. During 1997, a remedial investigation/baseline risk assessment (RI/BRA) was completed (DOE-ID 1997). The RI/BRA identified contaminants in the HI interbed in perched and SRPA groundwater, designated in WAG 3 as Group 5. The detected contaminants are identified and discussed in Section 3, Hazard Assessment.

Subsequent to the RI/BRA, an evaluation of remedial alternatives was made in a feasibility study (FS) and the selected alternatives were described in the OU 3-13 Record of Decision (ROD) (DOE-ID 1999). This HASP was prepared to support post-ROD monitoring to be implemented as part of the remedial actions for the SRPA.

### **1.4 Remedial Actions for the Snake River Plain Aquifer**

Contamination in the SRPA resulted primarily from historic waste disposal practices at INTEC. For a number of years, an injection well was used to dispose liquid process wastes into the SRPA. The selected SRPA alternative is institutional controls with monitoring and contingent remediation. This alternative accomplishes the following: restricts access to the SRPA within the groundwater plume boundaries using institutional controls to prevent exposure to contaminants, provides for continued monitoring of the contaminant plume to determine if contaminant concentrations exceed a specified action level, and requires treatability studies and active remediation if those action levels are exceeded.

Two primary activities will be implemented under the Group 5 project. The first activity is an evaluation of the model-predicted hot spot within the HI interbed to check the WAG 3 RI/FS model accuracy and update the model predictions for contaminant of concern (COC) concentrations in 2095 and beyond. The collection of data to support this task is described in the Plume Field Sampling Plan (FSP) (DOE-ID 2002a). The second activity is groundwater monitoring activities to evaluate the flux of COCs to Group 5 from the INTEC perched water and vadose zone (OU 3-13, Group 4) and the SRPA beneath the INTEC facility. The collection of data to support this ground water COC trend monitoring is discussed in the Group 5, Long-Term Monitoring Plan (LTMP) (DOE-ID 2003). Each activity is briefly described in Section 2. Figure 1-2. Identifies the selected aquifer wells for long-term monitoring.



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Figure 1-2. Identifies the selected aquifer wells for long-term monitoring.

## **2. SITE BACKGROUND AND PROJECT SCOPE**

The following information is provided to support waste management planning issues specific to potential volumes of waste, waste determinations for specific media (for example, saturated versus unsaturated drill cuttings), and administrative information (for example, inside or outside the INTEC security fence).

### **2.1 Plume Field Sampling Plan Scope**

The Group 5 Plume FSP will include coring boreholes, collecting deep HI sedimentary interbed samples for chemical and geotechnical analysis, lithologic and geophysical logging of coreholes, collecting aquifer water samples with straddle packers, and pump testing zones to evaluate production capacity. The basic objective of the Plume FSP is evaluating whether the OU 3-13 RI/FS modeling is accurate in predicting that a hot spot of primarily I-129 exists south of INTEC in the vicinity of wells United States Geological Survey (USGS) 111 and USGS 113 of sufficient magnitude to exceed maximum contaminant levels (MCLs) in 2095 and beyond.

The scope of the Plume FSP involves installing four new wells in the vicinity of the model-predicted hot spot south of INTEC to evaluate the existence and magnitude of the predicted hot spot. Figure 2-1 shows the locations of the new wells to be installed. Samples for chemical analysis of the COCs will be collected from interbed materials in addition to samples for physical and geotechnical analysis and to support hazardous waste determinations. The samples will provide empirical data on the presence of I-129 in the SRPA and physical properties of the HI interbed south of INTEC to support refining the groundwater model. Following drilling, a straddle packer system will be used at the four boreholes to collect groundwater samples for vertical profiles. If results of the vertical profiling indicate hot zones where COC action levels are exceeded, additional pump testing may be required to evaluate production capacity of the specific hot zones. This information will be analyzed to generate a volumetric estimate of the hot spot where concentrations are predicted to exceed MCLs in 2095 and beyond.

### **2.2 Long-Term Monitoring Plan Scope**

The basic objective of the LTMP actions is to evaluate the flux of contaminants into the SRPA outside of the INTEC security fence line (Group 5) from contamination that is currently in the vadose zone and aquifer beneath the footprint of the INTEC facility. These data will be evaluated over time to determine if the flux of COCs into Group 5 will result in exceeding MCLs in 2095 and beyond. This will be accomplished through sampling aquifer monitoring wells in the vicinity of INTEC to track COC concentration trends through the institutional control period. Initial baseline sampling will include all wells at and downgradient of WAG 3 (approximately 47 wells) to the INEEL Landfill Complex at Central Facilities Area (CFA). Following baseline sampling, a selected set of 18 wells will be sampled annually under the LTMP. The two types of wells monitored for the LTMP include (1) INTEC facility monitoring wells comprising 18 wells at and near the facility footprint, and (2) plume monitoring wells comprising seven wells located downgradient of INTEC roughly following the centerline of the INTEC groundwater contaminant plumes.

### **2.3 Scope of Work**

Figure 2-1 identifies the selected aquifer wells for long-term monitoring.

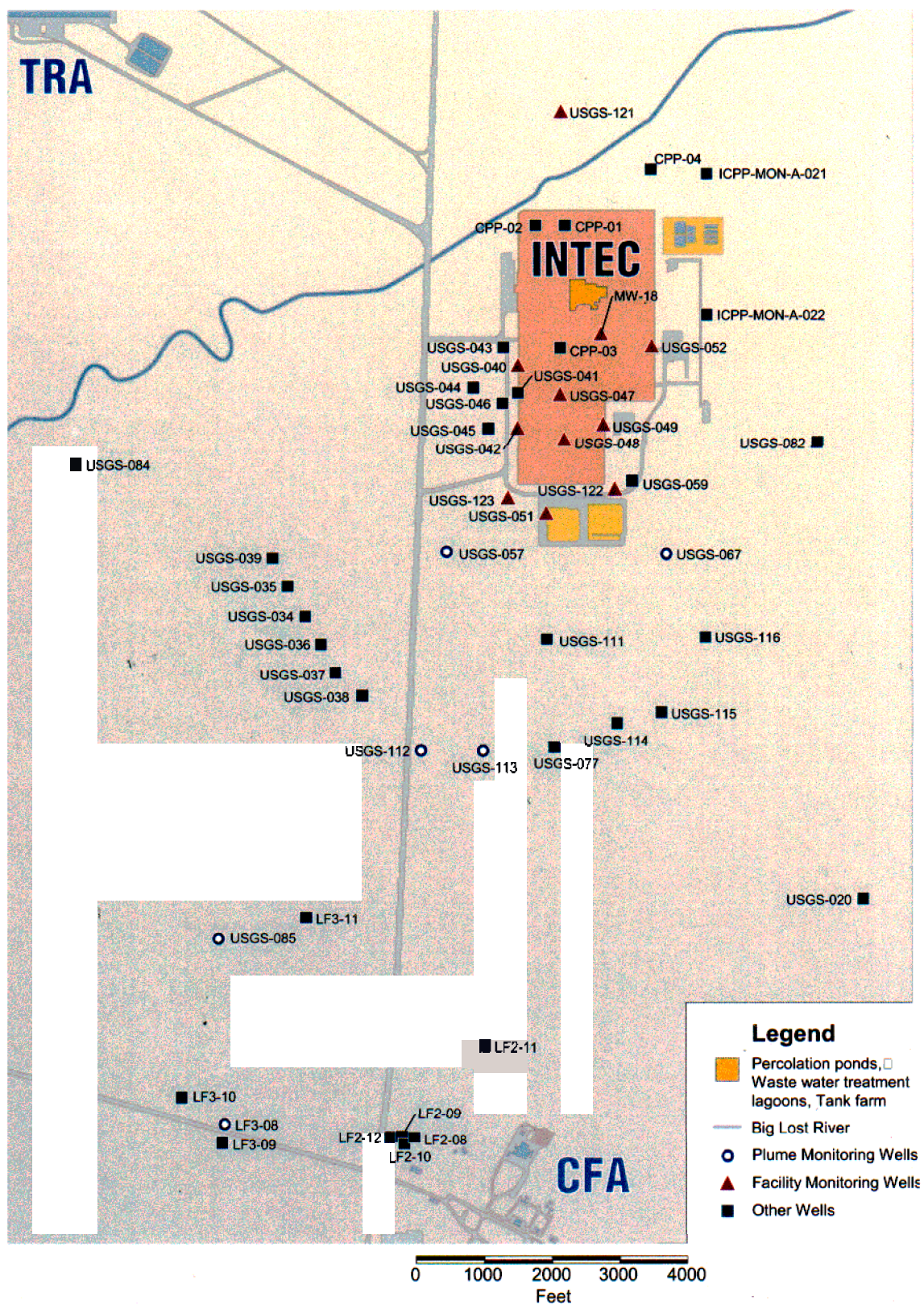


Figure 2-1. INTEC groundwater wells for long-term monitoring.

## **2.4 Program Interfaces**

The interface agreement between the program and INTEC (IAG-89) describes the working relationships for activities and programs conducted at INTEC. The programs at INTEC are being conducted under the regulatory authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 USC 6901 et seq.); the Final ROD for INTEC, WAG 3, and OU 3-13 (DOE-ID 1999); and FFA/CO (DOE-ID 1991).

### **3. HAZARD ASSESSMENT**

This document contains requirements for both contractor and subcontractor personnel conducting work at the INEEL. Contract personnel normally comply with companywide applicable company policies, procedures, and manuals as well as requirements outlined in work control documents, job safety analyses (JSAs), radiological work permits (RWPs), and this HASP in addition to their established safety and health programs and procedures. Subcontractors will be held responsible to follow their company safety and health program and procedures in addition to contract outlined requirements.

#### **3.1 Hazard Evaluation of Project Activities**

Personnel may be exposed to safety hazards, or to chemical, radiological, and physical agents while working on project tasks. The degree of the hazards posed depends on the nature of contaminants encountered and the specific tasks being performed. Table 3-1 summarizes the anticipated hazards associated with various project activities. Table 3-2 identifies the contaminants and maximum concentration levels that have been detected in the respective media in the project area (from the OU 3-13 Remedial Investigation/Feasibility Study [DOE-ID 1997] and OU 3-13 ROD [DOE 1999]) that project personnel could be potentially exposed to the following in the soils, interbeds, sediments, basalts, and perched water:

- Contaminants in unconsolidated soil, interbed sediments, and basalts
  - Gross alpha activity—up to 25 pCi/g
  - Gross beta activity—up to 25 pCi/g
  - Strontium-90—up to 800 pCi/g
- Contaminants in perched water
  - Strontium-90—up to 320,000 pCi/l
  - Tritium—up to 73,000 pCi/l
  - Technetium—up to 736 pCi/l
  - Nitrate—35.4 mg/L
  - Chloride—250 mg/L
  - Manganese—165 ug/L
  - Iron—324 ug/L.

The project activities may involve radiological hazards which will be monitored by on-Site radiological control technicians (RCTs), as they determine necessary. RCTs will develop RWPs, as needed, in accordance with applicable company manuals. Safe work permits may be prepared using applicable company policies and procedures. For instances where the project/task JSA does not address task hazards, a safe work permit (SWP) may be used as a temporary means of hazard identification and mitigation until the JSA is updated to reflect identified hazards. The RWP and JSAs will be used in conjunction with this HASP to address hazardous and radiological conditions at the site. These documents will augment this HASP and further detail protective measures, personal protective equipment (PPE), and dosimetry requirements.

Table 3-1. Project activities and associated hazards.

Activity or Task	Associated Hazards or Hazardous Agent
Mobilization/demobilization	Industrial safety hazards Heavy equipment for site preparation Heat or cold stress Back strain Noise
Drilling activities; soil, water, and rock sampling; geophysical logging	Overhead power lines/obstructions Industrial safety hazards Heat or cold stress Back strain Noise Radiological and inorganic contaminants
Well and instrumentation installation	Industrial safety hazards Heat or cold stress Back strain Silica flour inhalation
Equipment decontamination	Industrial safety hazards Heat or cold stress Back strain Noise Radiological and inorganic contaminants

Table 3-2. Contaminants and maximum concentration levels.

Contaminants in SRPA groundwater	
Contaminant	Maximum Concentration Level
Tritium	up to about 30,000 pCi/l
Sr-90	up to about 20 pCi/l
Iodine-129	up to about 1 pCi/l
Magnesium	up to 63 ug/L
Technetium-99	up to about 20 pCi/l
Pu-238	—
Pu-239	—
Pu-240	—
Chromium and mercury	trace levels

Table 3-3 presents an evaluation of these radiological and inorganic contaminants with respect to potential routes of exposure and symptoms of over-exposure. Additionally, the exposure potential by all routes is stated based on quantity of material present and toxicity.

Table 3-3. Evaluation of inorganic and radiological contaminants.

Material or Chemical (CAS No.)	Exposure Limit <sup>a</sup> (PEL/TLV)	Routes of Exposure <sup>b</sup>	Symptoms of Overexposure <sup>c</sup> (Acute and Chronic)	Target Organs/System	Carcinogen (source) <sup>d</sup>	Exposure Potential <sup>e</sup> (all routes without regard to PPE)
<b>Metals and Inorganic Compounds</b>						
Bentonite (sodium bentonite) 7631-86-9	10 mg/m <sup>3</sup> (inert nuisance dust)	Inh, Con	Mucous membrane and respiratory tract irritation	Lungs	No	Moderate-high potential (used for well completion)
Silica, crystalline (dust) 14464-46-1	0.05 mg/m <sup>3</sup> (respirable fraction)	Inh, Con	Pulmonary fibrosis, silicosis	Respiratory, eyes	No	Moderate-high potential Mixing of silica sand and flour for well completion
Silica, crystalline quartz (14464-46-1)	10 mg/m <sup>3</sup> (%SiO <sub>2</sub> +2) (respirable fraction)	Inh, Con	Pulmonary fibrosis, silicosis	Respiratory, eyes		Moderate-high potential Mixing of silica sand and flour for well completion
Chromium (7440-47-3)	ACGIH TLV - 0.5 mg/m <sup>3</sup>	Inh, Ing, Con	Irritation of eyes and skin, lung fibrosis (histologic)	Eyes, skin, respiratory tract	No	Low potential
Mercury (7439-97-6)	ACGIH TLV - 0.025 mg/m <sup>3</sup>	Inh, Ing, Con, Abs	Irritation eyes, skin; cough, chest pain, dyspnea, bronchial pneumonia; tremor, insomnia, irritability, indecision, headache, fatigue, weakness; gastrointestinal disturbance, anorexia, low weight	Eyes, skin, respiratory tract, central nervous system, kidneys	No	Low potential
<b>Radiological Contaminants (The dominant radioisotopes are tritium and strontium-90.)</b>						
Radionuclides (whole body exposure)	INEL - 1.5 rem/yr project ALARA dose limit-per RWP or ALARA Task Posting of radiation areas per INEL RCM	Whole body	No symptoms expected	Blood forming cells, GI tract, and rapidly dividing cells	Yes	Low potential Low doses from repeated handling of sample cores and from handling water samples

a. American Conference of Governmental Industrial Hygienists (ACGIH) 1997 TLV Booklet and OSHA 29 CFR 1910 substance specific standards.

b. (Inh) inhalation; (Ing) ingestion; (Abs) skin absorption; (Con) contact hazard.

c. (nervous system) dizziness/nausea/lightheadedness; (dermis) rashes/itching/redness; (respiratory) respiratory effects; (eyes) tearing/irritation;

d. If yes, identify agency and appropriate designation (ACGIH A1 or A2; NIOSH; OSHA; IARC; NTP).

e. Estimates (~) of specific compounds from Tables 3-2 and 3-3.

DAC = derived air concentration eV = electron volts

IE = ionization energy NTP = National Toxicology Program

MSDSs for these chemicals are available at the OU 3-13 vadose zone trailer.

IARC = International Agency for Research on Cancer

PEL = permissible exposure limit

TLV = threshold limit value

## 3.2 Routes of Exposure

Exposure pathways for hazardous materials and radionuclides are directly related to the nature of the project tasks. The exposure pathways for the radionuclides will be described in the RWP. Engineering controls (high-efficiency particulate air filtration), continuous monitoring, training, and work controls will mitigate potential contact and uptake of these hazards; however, the potential for exposure to contaminants still exists.

Exposure pathways include the following:

- Inhalation of radionuclide-contaminated fugitive dusts during intrusive activities and decontamination tasks. This contamination form may have trace amounts of inorganic compounds with radionuclides, resulting in potential lung deposition.
- Skin absorption and contact with radionuclides and inorganic compounds during exposure potential, that can be absorbed through unprotected skin or corrosion, resulting in chemical burns, uptake through skin absorption and/or skin contamination, and type of work will be described in the SWP or RWP.
- Ingestion of radionuclides and inorganic compounds adsorbed to dust particles or waste residues exposure potential, uptake of contaminants through the gastrointestinal (GI) tract that result in GI irritation, internal tissue irradiation, and/or deposition to target organs, and type of work will be described in the SWP or RWP.
- Injection while handling radionuclides and inorganic compounds by breaking of the skin, or migration through an existing wound, resulting in localized irritation, contamination, uptake of soluble contaminants, and deposition of insoluble contaminants.

## 3.3 Environmental and Personnel Monitoring

The potential for exposure to radiological and nonradiological hazards exists during many of the tasks that will take place during the WAG 3, OU 3-13, Group 5, SRPA Project and affects all personnel who work in the contamination reduction zone (CRZ) and exclusion zone (EZ). Site Control and Security (Section 8), engineering and administrative controls, worker training, and the use of protective equipment will mitigate most of these hazards to a large degree. Monitoring with direct-reading instruments will be conducted to provide Radiological Control (RadCon) and industrial hygiene (IH) personnel with real-time data to assess the effectiveness of these controls. IH will use direct-reading instrumentation for mercury and noise only on this project.

The greatest exposure potential(s) for the project will be described in the SWP and/or RWP. The IH and RadCon personnel will focus on the activities and monitor with direct-reading instrumentation, swipes, and full and partial period air sampling in accordance with the applicable TPRs, written for the project, and/or other guidelines, as deemed appropriate. Other workers and areas of the site will also be monitored to verify the integrity of core sample packages, to ensure that contamination has not migrated from radionuclide-contaminated material areas or waste containers, and to determine the effectiveness of contamination control and decontamination practices.

Personnel working on the project may be exposed to hazardous materials or hazardous physical agents, as already described. Safety hazards and other physical hazards will be monitored and controlled, as outlined in Section 3.4.

### **3.3.1 Industrial Hygiene Monitoring**

When there is a potential for the spread of contamination during the drilling process or work associated with the drilling process, characterization monitoring for surface radionuclide contamination may provide an additional indicator of nonradiological hazards. Various direct-reading instruments and other semiquantitative detection tests will be used to determine the presence of nonradiological and other physical agents. The frequency and type of sampling and monitoring will be determined by changing site conditions, direct-reading instrument results, observation, and professional judgement. All full and partial period airborne contaminant sampling will be conducted, using applicable National Institute of Occupational Safety and Health (NIOSH) or OSHA methods and conforming to applicable company manuals. Risk assessments for site personnel will be conducted according to applicable company policies and procedures.

**3.3.1.1 Industrial Hygiene Instrument and Equipment Calibration.** All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations and existing IH protocol and in conformance to applicable company policies and procedures. Direct-reading instruments will be calibrated, at a minimum, prior to daily use and more frequently, as determined by the project IH. Calibration information, sampling and monitoring data, results from direct-reading instruments, and field observations will be recorded, as described in Section 13.

### **3.3.2 Radiological Monitoring**

During this project, the potential exists for exposure to both external and internal radiation (inhalable, ingestible, or absorbed radioactive contaminants). As with the nonradiological contaminants discussed above, the greatest potential for both external and internal radiation exposures will be described in the RWP and/or work order. Monitoring will be performed in accordance with the applicable company policies and procedures.

Based on the unique and distinctive hazards presented by both external and internal radiation sources, they will be evaluated, controlled, and monitored individually (although the detection of any radionuclides will serve to alert for the presence of both). For purposes of this monitoring section, they will be discussed separately and distinguished by their effects as radiation (external) and contamination (internal). Radiological monitoring will include area, airborne, equipment, and personnel monitoring. These data will be used by RadCon personnel to evaluate the effectiveness of engineering controls, ensure the adequacy of work zone boundaries, alert project personnel to potential high radiation sources, and ensure the effectiveness of decontamination methods and practices.

### **3.3.3 Radiological Engineer and Industrial Hygiene Exposure Assessments**

Although the potential for exposure to site contaminants is anticipated to be low for this project, action levels for suspected radiological contaminants are established and presented in Table 3-4 to prevent and mitigate potential personnel exposure. If action levels are reached, personnel will take the appropriate actions listed in Table 3-4. Nonradiological action levels in Table 3-4 are limited to noise exposure.

## **3.4 Physical Hazards Evaluation, Control, and Monitoring**

The physical hazards present at the project area and the methods that will be used to monitor and control them are described in this section. It is critical that all personnel are aware and understand the nature of the tasks to be conducted, the equipment to be used, and the controls to be in place to eliminate or mitigate potential safety hazards.

Table 3-4. Action levels and associated responses for anticipated project hazards.

Contaminant/Agent Monitored	Action Level	Response Taken if Action Levels Exceeded
Hazardous noise levels	<85 dBA 8-hour TWA, <83dBA 10-hour TWA	No action
	85–114 dBA	Hearing protection is required to attenuate to below 85 dBA 8-hour TWA or 83 dBA for 10-hour TWA (based device NRR).
Radiation field	(a) >115 dBA	(a) Isolate source, evaluate NRR for single device, double protection, as needed.
	(b) >140 dBA	(b) Control entry, isolate source, wear only approved double protection.
	<5 mrem/hr	No action, no posting is required.
	5–100 mrem/hr @ 30 cm (§835.603.b)	Post as “Radiation Area.” Required items include radiation worker I training or II training, RWP, personal dosimetry.
	>100 mrem – 500 Rad @ 100 cm (§835.603.b)	Post as “High Radiation Area.” Required items include RW II training, RWP, alarming personal dosimetry, dose rate meter, and temporary shielding, as required.
Radionuclide contamination	Exceed remote air monitor alarming set point, if required (fast ringing bell, flashing red light)	Evacuate area immediately, muster at CRZ and await instruction from RCT.
	1–100 times company determined limits (§835.603.d)	Post as “Contamination Area.” Required items include RW II training, personal dosimetry, RWP, PPE, bioassay submittal, as required.
	>100 times company determined limits (§835.603.d)	Post as “High Contamination Area.” Required items include RW II training, personal dosimetry, RWP (with prejob briefing), PPE, bioassay submittal, as required.
Airborne radioactivity	Concentrations (µCi/cc) >30% of DAC value (§835.603.d)	Post as “Airborne Radioactivity Area.” Required items include RW II training, personal dosimetry, RWP (with prejob briefing), PPE, bioassay submittal, as required.
	Exceed continuous air monitor alarming set point, (fast ringing bell, flashing red light)	If not in Level B respiratory protection, evacuate upwind to CRZ, await RCT. If in Level B respiratory protection, leave immediate area to upwind location, maintain airline connection and await RadCon instructions.

TWA = time-weighted average

dBA = decibel A-weighted

NRR = Nuclear Reactor Regulation

### 3.4.1 Temperature and Ultraviolet Light Hazards

Project tasks will be conducted during times when there is a potential heat and cold stress that could present a potential hazard to personnel. The IH and health and safety officer (HSO) will be responsible for obtaining meteorological information to determine if additional heat or cold stress administrative controls are required. All project personnel must understand the hazards associated with heat and cold stress and take preventive measures to minimize the effects. Applicable company policies and procedures guidelines will be followed when determining work-rest schedules or when to halt work activities due to temperature extremes.

**3.4.1.1 Heat Stress.** High ambient air temperatures can result in increased body temperature, heat fatigue, heat exhaustion, or heat stroke that can lead to symptoms ranging from physical discomfort, unconsciousness, to death. In addition, tasks requiring the use of protective equipment or respiratory protection prevent the body from cooling. Personnel must inform the FTL or HSO when experiencing any signs or symptoms of heat stress or observing a fellow employee (i.e., buddy) experiencing them. Heat stress stay times will be documented on the appropriate work control document(s), that is, an SWP, Prejob Briefing Form, or other by the HSO in conjunction with the IH (as required) when personnel wear PPE that may increase heat body burden. These stay times will take into account the amount of time spent on a task, the nature of the work (i.e., light, moderate, or heavy), type of PPE worn, and ambient work temperatures. Table 3-5 lists heat stress signs and symptoms of exposure.

**3.4.1.2 Low Temperatures and Cold Stress.** Personnel will be exposed to low temperatures during fall and winter months or at other times of the year if relatively cool ambient temperatures combined with wet or windy conditions exist.

Additional cold weather hazards may exist from working on snow- or ice-covered surfaces. Slip, fall, and material-handling hazards are increased under these conditions. Every effort must be made to ensure walking surfaces are kept clear of ice. The FTL or HSO should be notified immediately if slip or fall hazards are identified at the project locations.

**3.4.1.3 Ultraviolet Light Exposure.** Personnel exposed to ultraviolet (UV) light (i.e., sunlight) while conducting project tasks are reminded to protect themselves from sunlight. Sunlight is the main source of UV known to damage the skin and potentially cause skin cancer. The amount of UV exposure depends on the strength of the light, the length of exposure, and whether the skin is protected. Since UV rays or suntans are unsafe, the following mitigative actions are recommended to minimize UV exposure:

- Wear clothing to cover the skin (long pants [no shorts] and long-sleeve or short-sleeve shirt [no tank tops])
- Use a sunscreen with a minimum sun protection factor (SPF) of 15
- Wear a hat (hard hat where required)
- Wear UV-absorbing safety glasses
- Limit exposure during peak intensity hours of 10 a.m. to 4 p.m. whenever possible.

Table 3-5. Heat stress signs and symptoms of exposure.

Heat-Related Illness	Signs and Symptoms	Emergency Care
Heat rash	Red skin rash and reduced sweating.	Keep the skin clean, change all clothing daily, and cover affected areas with powder containing cornstarch or with plain cornstarch.
Heat cramps	Severe muscle cramps and exhaustion, sometimes with dizziness or periods of faintness.	Move the patient to a nearby cool place. Give the patient half-strength electrolytic fluids; if cramps persist, or if signs that are more serious develop, seek medical attention.
Heat exhaustion	Rapid, shallow breathing; weak pulse; <u>cold, clammy skin</u> ; <u>heavy perspiration</u> ; total body weakness; dizziness that sometimes leads to unconsciousness.	Move the patient to a nearby cool place, keep the patient at rest, give the patient half-strength electrolytic fluids, treat for shock, and seek medical attention. <b>DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT.</b>
Heat stroke	Deep, then shallow, breathing; rapid, strong pulse, then rapid, weak pulse; <u>dry, hot skin</u> ; dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching.	Cool the patient rapidly. Treat for shock. If cold packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the neck. Seek medical attention as rapidly as possible. Monitor the patient's vital signs constantly. <b>DO NOT ADMINISTER FLUIDS OF ANY KIND.</b>

**NOTE:** Heat exhaustion and heat stroke are extremely serious conditions that can result in death and should be treated as such. The FTL or designee should immediately request an ambulance (777, 526-1515, or 9-911 from cell phones) be dispatched from the CFA-1612 medical facility and the individual cooled as described above in Table 3-5 based on the nature of the heat stress illness.

### 3.4.2 Inclement Weather Conditions

When inclement or adverse weather conditions develop that may pose a threat to persons or property at the project site (e.g., sustained strong winds 25 mph or greater, electrical storms, heavy precipitation, or extreme heat or cold), conditions will be evaluated and a decision made by the HSO with input from other personnel to halt work, employ compensatory measures, or proceed. The FTL and HSO will comply with company policies and procedures and facility work control documents that specify limits for inclement weather.

### 3.4.3 Noise

Personnel working at the task site may be exposed to noise levels that exceed 85 decibels (dBA) for 8-hour time weighted average (TWA) and 83 dBA for 10-hour TWA. The effects of high sound levels (noise) may include the following:

- Personnel being startled, distracted, or fatigued
- Physical damage to the ear, pain, and temporary or permanent hearing loss
- Interfere with communication that would warn of danger.

Noise measurements will be performed by the IH per the applicable company policies and procedures to determine if personnel assigned to the jobs identified are above allowable noise exposure

levels. A threshold–limit value (TLV) of 85 dBA (TWA) will be applied to personnel exposed to noise levels over no more than an 8-hour day. This level is based on a 16-hour “recovery” period in a low noise environment. If personnel are required to work longer than 8 hours in a hazardous noise environment, then the TLV will be adjusted to a lower value. The project IH must be consulted regarding modifications to the 85 dBA for an 8-hour TLV and 83 dBA for a 10-hour TWA value.

Personnel, whose noise exposure meets or exceeds the allowable level, will be enrolled in the INEEL Occupational Medical Program (OMP) or subcontractor Hearing Conservation Program. Personnel working on jobs that have noise exposures greater than 85 dBA (83 dBA for 10 hour TWA), will be required to wear hearing protection until noise levels have been evaluated and will continue to wear the hearing protection specified by the IH until directed otherwise.

Individuals having experienced a permanent threshold shift should wear hearing protection at noise levels of 80 dBA or greater. Drilling operations are noisy and hearing conservation should be taken seriously by all exposed persons.

### **3.4.4 Fire, Explosion, and Reactive Materials Hazards**

Fire, explosion, and reactive materials hazards at the task site include potential explosive atmospheres, combustible materials near ignition sources (hot motor or exhaust system), transfer and storage of flammable or combustible liquids in the support zone (SZ), and chemical reaction (reduction, oxidation, exothermic reaction) from incompatible waste materials. Portable fire extinguishers with a minimum rating of 10A/60BC will be strategically located at the site to combat Class ABC fires. They will be located in all active work areas, on or near site equipment with exhaust heat sources, and near all equipment capable of generating ignition or having the potential to spark. All project field team members will receive fire extinguisher training, as necessary, as part of this HASP training, as listed in Section 7, Table 7-1.

**3.4.4.1 Project Equipment Fire Hazards.** Combustible or ignitable materials in contact with or near exhaust manifolds, catalytic converters, or other ignition sources could result in a fire. The project fire protection engineer will identify these sources as equipment is brought on the site. The accumulation of combustible materials will be strictly controlled during the project. Disposal of combustible materials will be assessed at the end of each shift. Class A combustibles such as trash, cardboard, rags, wood, and plastic will be properly disposed in metal receptacles in the SZ and in appropriate waste containers within the contamination reduction corridor (CRC), CRZ, and EZ.

Fuels that will be used at the task site for equipment will be safely stored, handled, and used. Only Factory Mutual/Underwriters Laboratories-approved flammable liquid containers, labeled with the content, will be used to store fuel. All fuel containers will be stored at least 15 m (50 ft) from any facilities (trailers) and ignition sources or stored inside an approved flammable storage cabinet. Additional requirements are provided in applicable company policies and procedures. Portable motorized equipment such as generators and light plants will be shut off and allowed to cool down in accordance with the manufacturer’s operating instructions prior to refueling to minimize the potential for a fuel fire. Refueling tasks will only be conducted by qualified fuel handling personnel.

### **3.4.5 Biological Hazards**

The INEEL is located in an area that provides habitat for various rodents, insects, and vectors (i.e., organisms that carry disease-causing microorganisms from one host to another). The potential exists for encountering nesting materials or other biological hazards and vectors. The Hantavirus may be present in the nesting and fecal matter of deer mice. If such materials are disturbed, they can become airborne and

create a potential inhalation pathway for the virus. Contact and improper removal of these materials may provide additional inhalation exposure risks.

If suspected rodent nesting or excrement material is encountered, the industrial hygienist will be notified immediately and **no attempt will be made to remove or clean the area**. Following an evaluation of the area, disinfection and removal of such material will be conducted in accordance with applicable company policies and procedures.

Snakes, insects, and arachnids (e.g., spiders, ticks, and mosquitoes) also may be encountered. Common areas to avoid include material stacking and staging areas, under existing structures (e.g., trailers and buildings), under boxes, and other areas that provide shelter. Protective clothing will generally prevent insects from direct contact with the skin. If potentially dangerous snakes or spiders are found or are suspected of being present, warn others, keep clear and contact the industrial hygienist or HSO for additional guidance as required.

Insect repellant (DEET or equivalent) may be required. Areas where standing water has accumulated (e.g., evaporation ponds) provide breeding grounds for mosquitoes and should be avoided. In cases where a large area of standing water is encountered, it may be necessary to pump the water out of the declivity (areas other than the evaporation ponds).

### **3.4.6 Safety Hazards**

Industrial safety hazards pose a significant potential threat to personnel who will be performing tasks during this project. Section 6 provides general safe-work practices that must be followed at all times. The following sections describe specific industrial safety hazards and procedures to be followed to eliminate or minimize potential hazards to project personnel.

**3.4.6.1 Handling Heavy Objects.** During the course of any drilling project, there are numerous tasks that require handling or moving heavy objects. Manual material handling will be minimized through task design and use of mechanical and/or hydraulic lifts, whenever possible.

**3.4.6.2 Powered Equipment and Tools.** All power equipment and tools will be properly maintained and used by qualified individuals according to the manufacturer's specifications. Applicable company policies and procedures will be followed for all work performed with powered equipment, including powered steam cleaners.

**3.4.6.3 Heavy Equipment and Moving Machinery.** The hazards, associated with the operation of heavy equipment, include injury to personnel, equipment damage, and/or property damage. All heavy equipment will be operated in the manner in which it was intended and according to manufacturer's instructions. Only authorized personnel will be allowed in the vicinity of operating heavy equipment and should maintain visual communication with the operator. Work-site personnel will comply with applicable company policies and procedures.

Site personnel working around or near heavy equipment and other moving machinery will comply with the appropriate applicable company policies and procedures. Additional safe practices will include the following:

- Ensuring that all heavy equipment has functional backup alarms.
- Prohibiting walking directly in back of or to the side of heavy equipment without the operator's knowledge; all precautions will have been taken prior to moving heavy equipment.

- While operating heavy equipment in the work area, the equipment operator will maintain communication with a designated person responsible for providing direct voice contact or approved standard hand signals; in addition, all site personnel in the immediate work area will be made aware of the equipment operations.
- Keeping all equipment out of traffic lanes and access ways and storing it so as not to endanger personnel at any time.

**3.4.6.4 Electrical Hazards/Energized Systems.** Electrical equipment and tools, as well as underground lines, may pose shock or electrocution hazards to personnel. Safety-related work practices will be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. If work on energized systems is necessary, these practices will conform to the requirements in applicable company policies and procedures and Parts I through III of National Fire Protection Association 70E. In addition, all electrical work will be reviewed and completed under the appropriate work controls (i.e., HASP, SWPs, work orders).

Before beginning any subsurface penetrations, underground utility clearances will be obtained by contacting telecommunications (526-1688 or 526-2512). Subsurface investigation clearance will be obtained in accordance with applicable company policies and procedures. The requirements for advanced 48-hour notice will be met.

**3.4.6.5 Personal Protective Equipment.** Wearing PPE will reduce a worker's ability to move freely, see clearly, and hear noise that might indicate a hazard and directions. Also, PPE can increase the risk of heat stress. Work activities at the task site will be modified, as necessary, to ensure that personnel are able to work safely in the required PPE. Work-site personnel will comply with applicable company policies and procedures. The OU 3-13 Post-ROD Monitoring Project PPE levels for each task are described in Section 6 and listed in Table 6-1 of that section.

**3.4.6.6 Decontamination.** Decontamination procedures for personnel and equipment are detailed in Section 10. The appropriate applicable company policies and procedures provide additional requirements for chemical and radionuclide decontamination requirements.

Decontamination procedures (Section 12) and applicable company policies and procedures must be followed and the appropriate level of PPE worn during decontamination activities. Project RadCon and IH personnel will follow applicable company policies and procedures, and general IH practices.

**3.4.6.7 Inclement Weather Conditions.** When inclement or adverse weather conditions develop that may pose a threat to people or property at the task site (such as sustained strong winds 25 mph or greater, electrical storms, heavy precipitation, or extreme heat or cold), these conditions will be evaluated and a decision made by the FTL and STR with input from the HSO, IH, safety engineer (SE), RCT, and other project personnel, as appropriate, to stop work, employ compensatory measures, or to proceed. The FTL and STR will comply with company policies and procedures and site work control documents that specify limits for inclement weather.

## 3.5 Other Site Hazards

Site personnel should continually look for potential hazards and immediately inform the FTL or HSO of the hazards so that action can be taken to correct the condition.

The FTL, HSO, RCT, and STR will conduct daily inspections of the task site to ensure that barriers and signs are being maintained, unsafe conditions are corrected, and debris is not accumulating on the

site. These inspections will be noted in the FTL logbook. Health and safety engineers present at the task site may, at any time, recommend changes in work habits to the FTL. However, all changes that may affect the project written work control documents (HASP, RWPs, SWPs) must have concurrence from the appropriate project technical discipline representative on-Site and a data analysis report must be prepared, as required.

Personnel working at the task site are responsible for using safe-work techniques, reporting unsafe working conditions, and exercising good personal hygiene and housekeeping habits throughout the course of their job.

### **3.5.1 Material Handling and Back Strain**

Material handling and maneuvering of various pieces of equipment may result in employee injury. All lifting and material-handling tasks will be performed in accordance with applicable company policies and procedures. Personnel will not physically lift objects weighing more than 22 kg (50 lb) or 33% of their body weight (whichever is less) alone. Additionally, back strain and ergonomic considerations must be given to material handling and equipment usage. Mechanical and hydraulic lifting devices should be used to move materials whenever possible. The industrial hygienist will conduct ergonomic evaluations of various project tasks to determine the potential ergonomic hazards and provide recommendations to mitigate these hazards. Applicable requirements from company policies and procedures will be followed.

### **3.5.2 Working and Walking Surfaces**

Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls. The various work surfaces associated with drilling and sampling activities present inherent tripping hazards because of uneven ground, equipment in use, and metal working surfaces. Additionally, the potential for slip, trip, and fall hazards will increase during winter months because of ice- and snow-covered surfaces combined with objects beneath the snow. During the prejob briefing, all personnel will be made aware of tripping hazards that cannot be eliminated. Tripping and slip hazards will be evaluated during the course of the project in accordance with applicable company policies and procedures.

### **3.5.3 Elevated Work Areas**

Personnel may sometimes be required to work on elevated equipment or at heights above 1.8 m (6 ft). During such work, employees will comply with requirements from applicable company policies and procedures. Where required, a fall protection plan will be written.

### **3.5.4 Pressurized Systems**

Drilling equipment operated on this project utilizes high pressure air and hydraulic systems. The hazards presented to personnel, equipment, facilities or the environment because of inadequately designed or improperly operated pressure systems include blast effects, shrapnel, fluid jets, release of toxic or asphyxiant materials, contamination, equipment damage, personnel injury, and death. These systems can include pneumatic, hydraulic, or compressed gas systems. The requirements of applicable company policies and procedures, and the manufacturer's operating and maintenance instructions must be followed. This includes inspection, maintenance, and testing of systems and components in conformance with American National Standards Institute (ANSI), Compressed Gas Association, etc.

All pressure systems will be operated in the designed operating pressure range, which is typically 10 to 20% less than the maximum allowable working pressure. Additionally, all hoses, fittings, lines,

gauges, and system components will be rated for the system for at least the maximum allowable working pressure (generally the relief set point). The project safety professional should be consulted about any questions of pressure systems in use at the project site.

## **3.6 Drilling Hazards**

Air rotary drilling (or equivalent) will be used to core to the required depths. Drilling personnel will be aware of potential drilling equipment hazards and body positioning during all material handling tasks. Specific hazards associated with drill rigs are described below. Additional hazards and mitigation information is described in the current project, Well Drilling and Sampling JSA, which must be followed by persons conducting drilling, monitoring, and sampling activities under this HASP.

### **3.6.1 Excavation, Surface Penetrations, and Outages**

Excavation activities conducted in conjunction with drilling activities are considered ground penetrations. All surface penetrations and related outages will be coordinated through and will require submittal of an outage request for outages (e.g., road, electrical, and water). The submission of an outage request will not be considered an approval to start the work. Other specific outage requirements are addressed in the special conditions section of the management and operating contract. No surface penetrations will be allowed or conducted until the area has been evaluated and an approved subsurface evaluation documented.

All excavation activities will be conducted and monitored in accordance with applicable company policies and procedures and 29 CFR 1926, Subpart P, "Excavations." The following are some key elements from these requirements:

- The location of utility installations (e.g., sewer, telephone, fuel, electric, water lines, or any other underground installations) that may reasonably be expected to be encountered during excavation work will be determined before opening an excavation.
- Structural ramps that are used solely by employees as a means of access or egress from excavations will be designed by a competent person. Structural ramps used for access or egress of equipment will be designed by a competent person qualified in structural design and will be constructed in accordance with the design. Structural ramps will be inspected in accordance with applicable company forms.
- Employees exposed to public vehicular traffic will be provided with and will wear warning vests or other suitable garments marked with or made of reflecting or high-visibility material.
- Daily inspections of excavations, areas adjacent to the excavations, and protective systems will be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection will be conducted by the competent person before the start of work and as needed throughout the shift. Inspections also will be made after every rainstorm or other hazard-increasing occurrence.
- Sloping or benching will be constructed and maintained in accordance with the requirements set forth in 29 CFR 1926, Subpart B, Appendix B, for the soil type as classified by the competent person. This classification of the soil deposits will be made based on the results of at least one visual inspection and at least one manual analysis.

### **3.6.2 Slips**

Slips are toothed wedges positioned between the drill pipe and the master bushing of rotary cable to suspend the drill string in the well bore when it is not supported by the hoist. Most accidents associated with slip operation are related to manual material handling; strained backs and shoulders are common.

### **3.6.3 Elevators**

Elevators are a set of clamps affixed to the bails of the swivel below the traveling block. They are clamped to each side of a drill pipe and hold the pipe as it is pulled from the well bore. Accidents and injuries can occur during the latching and unlatching tasks; fingers and hands can get caught and crushed in the elevator latch mechanism. If the pipe is overhead when the latching mechanism fails, pipe may fall on workers on the drill floor.

### **3.6.4 Catlines/Hoist Lines**

Catlines are used on drilling rigs to hoist material. Accidents that occur during catline operations may injure the rigger as well as the catline operator. Minimal control over hoisting materials can cause sudden and erratic load movements which may result in hand and foot injuries.

### **3.6.5 Working Surfaces**

The rig floor is the working surface for most tasks performed in well drilling operations. The surface is frequently wet from circulating fluid, muddy cuttings, and water used or removed from the borehole during drilling operations. Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls.

### **3.6.6 Material Handling**

The most common type of accident that occurs during material handling is when a load is being handled and a finger or toe is caught between two objects. Rolling stock can shift or fall from a pipe rack or truck bed. Fingers and hands can be caught between sampling barrels, breakout vices, and tools.

### **3.6.7 High-Pressure Lines**

A high-pressure diversion system will be used to carry cuttings away from the borehole. All high-pressure lines will be equipped with positive locking connectors (e.g., cams) and be secured with properly rated whip checks in case of a connection failure. The project safety professional will be consulted about the rating and proper placements of whip checks or equivalent restraining devices.

### **3.6.8 Overhead Objects**

Personnel may be exposed to falling overhead objects, debris, or equipment or impact hazards during the course of the project from drilling and well installation activities. Sources for these hazards will be identified and mitigated in accordance with applicable company policies and procedures. In the case of overhead impact hazards, they will be marked by using engineering-controls protective systems where there is a potential for falling debris, in combination with head protection PPE.

### 3.6.9 Hoisting and Rigging of Equipment

All hoisting and rigging of the materials during well installation, maintenance, and drilling activities will be performed in accordance with applicable company policies and procedures and DOE-STD-1090-2001 “Hoisting and Rigging.” Subcontractors shall also comply with Hoisting and rigging equipment will show evidence of a current inspection (e.g., tag) and be inspected before use by qualified personnel. Additionally, the operator or designated person for mobile cranes or boom trucks will perform a visual inspection each day or before use (if the crane has not been in regular service) of items such as, but not limited to, the following:

- All control mechanisms for maladjustment that would interfere with proper operation
- Crane hooks and latches for deformation, cracks, and wear
- Hydraulic systems for proper oil level
- Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leakage
- Hoist ropes for kinking, crushing, birdcaging, and corrosion
- All anti-two-block, two-block warning, and two-block damage prevention systems for proper operation.

<p><b>NOTE:</b> The operator or other designated person will examine deficiencies and determine whether they constitute a safety hazard. If deficiencies are found, they will be reported to the safety professional.</p>
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## 3.7 Site Inspections

Project personnel may participate in site inspections during the work control preparation stage (such as the hazard identification and verification walkdowns), conduct self-assessments or other inspections. Additionally, the HSO, project manager, or FTL will perform periodic safety inspections in accordance with applicable company policies and procedures.

Targeted or required self-assessments may be performed during investigation and sampling operations in accordance with applicable company policies and procedures. All inspections and assessments will be documented and available for review by the FTL. These inspections will be noted in the FLT logbook. Health and safety professionals present at the task site may, at any time, recommend changes in work habits to the FTL.

## **4. EXPOSURE MONITORING AND SAMPLING**

A potential for exposure to radiological, chemical, and physical hazards exists during project tasks including well installation and routine sampling activities which may affect all personnel who work on the WAG 3, OU 3-13, Group 5, SRPA Project. Site Control and Security (Section 8) describes the use of engineering and administrative controls, worker training, and wearing PPE to provide the mitigation strategy for these hazards. Monitoring and sampling will be conducted during project tasks to (1) assess the effectiveness of these controls, (2) determine the type of PPE needed for individual tasks, and (3) determine the need for upgrading and downgrading of PPE as described in Section 6. Monitoring with direct-reading instruments will be conducted as deemed appropriate to provide RadCon and IH personnel with real-time data to assess the effectiveness of control measures. Subcontractors are responsible for conducting their employee chemical monitoring and physical agent evaluations.

Table 4-1 lists the tasks and hazards to be monitored, the frequency, and the monitoring instruments. Table 4-2 lists the action levels and associated responses for specific hazards.

### **4.1 Exposure Limits**

Exposure limits are identified in Table 3-3 for specific project tasks. Project tasks will be continually assessed in accordance with applicable company policies and procedures and evaluated by RadCon and IH personnel to ensure engineering control effectiveness. Action limits should be adjusted as required based on changing site conditions, exposure mitigation practices, and PPE levels.

### **4.2 Action Limits**

Action limits are one-half or 50% the exposure limits identified in Table 3-1 to serve as the initial limits for specific ICDF operations. Monitoring results at or above an action limit, identified through exposure monitoring, will initiate additional evaluations including consideration for improved engineering controls, administrative controls, reevaluation of personal protective equipment, and probable need for additional exposure monitoring based on the industrial hygienist's recommendations. Action limits may be adjusted based on changing site conditions, exposure mitigation practices, and PPE levels.

### **4.3 Environmental and Personnel Monitoring**

RadCon and IH personnel will conduct initial and periodic monitoring with direct-reading instruments, collect swipes, and conduct full- and partial-period air sampling, as deemed appropriate, in accordance with the applicable company policies and procedures, OSHA substance-specific standards, and as stated on work permits and other guidelines. New processes or hazards introduced will be evaluated and controlled in accordance with applicable company policies and procedures. Instrumentation listed on Table 4-1 will be selected based on the site-specific conditions and contaminants associated with project tasks. The RCT and IH will be responsible for determining the best monitoring technique for radiological and nonradiological contaminants respectively. Safety hazards and other physical hazards will be monitored and mitigated as outlined in Section 3.

#### **4.3.1 Industrial Hygiene Area and Personal Monitoring and Instrument Calibration**

The project industrial hygienist will conduct full- and partial-period sampling of airborne contaminants and monitoring of physical agents at a frequency deemed appropriate based on direct-reading instrument readings and changing site conditions. When conducted, all air sampling will be conducted using applicable NIOSH, OSHA, or other validated method. Both personal and area sampling and monitoring may be conducted.

Table 4-1. Tasks and hazards to be monitored, frequency, and monitoring instruments.

Tasks	Hazard(s) to be Monitored	Instrument Category to be Used	Instrument Category #	Monitoring Instruments Description <sup>a,b</sup>
Well drilling and instrument placement, repair, removal	Ionizing radiation—(alpha, beta, gamma)	1	1	(Alpha) Count rate—Bicron/NE Electra (DP-6 or AP-5 probe) or equivalent.
	Radionuclide contamination—(alpha, beta, gamma)	2		Stationary—Eberline RM-25 (HP-380AB or HP-380A probe) or equivalent.
	Chemical constituents—organic vapors, lead, cadmium	3, 4		(Beta-gamma) Count rate—Bicron NE/Electra (DP-6, BP-17 probes) or equivalent.
	Respirable dust—silica (area and personal)	3, 5		Stationary—Eberline RM-25 (HP-360AB probe) or equivalent.
Well sampling activities	Hazardous noise	6	2	Continuous air monitor (CAM)—ALPHA 6-A-1 (in-line and radial sample heads, pump, RS-485) or equivalent (as required).
	Ergonomics, repetitive motion, lifting	7		CAM (beta)—AMS-4 (in-line and radial head, pump RS-485) or equivalent (as required).
	Heat and cold stress	8		Grab sampler—SAIC H-810 or equivalent.
	Ionizing radiation—(alpha, beta, gamma)	1		(Organic vapor) Direct reading instruments (photoionization detector, flame ionization detector, or infrared detector) detector tubes or grab samples.
Wastewater transfer/handling operations	Radionuclide contamination—(alpha, beta, gamma)	2	3	(Dust) Direct-reading instrument (miniram).
	Respirable dust—silica (area)	4, 5		
	Ionizing radiation—(alpha, beta, gamma)	1		
	Radionuclide contamination—(alpha, beta, gamma)	2	4	(Organic vapors and lead) Personal sampling pumps with appropriate media for partial and full period sampling using NIOSH or OSHA-validated methods.
	Chemical constituents—organic vapors, lead	3, 4		
	Respirable dust—silica (area and personal)	3, 5		
	Hazardous noise	6		
	Ergonomics, repetitive motion, lifting	7		
	Heat and cold stress	8	5	(Silica dust, respirable) NIOSH 7500 or equivalent, personal sampling pump, 10-mm cyclone, full-period sampling.
	Radionuclide contamination—(alpha, beta, gamma)	2		
	Respirable dust—silica (area)	4, 5		

Table 4-1. (continued).

Tasks	Hazard(s) to be Monitored	Instrument Category to be Used	Instrument Category #	Monitoring Instruments Description <sup>a,b</sup>
Heavy equipment operations	Respirable dust—silica (area and personal)	4, 5	6	ANSI Type S2A sound level meter or ANSI S1.25-1991 dosimeter (A-weighted scale for time-weighted average dosimetry, C-weighted for impact dominant sound environments).
	Hazardous noise	6		
	Ergonomics, repetitive motion, lifting	7		
Decontamination of equipment	Radionuclide contamination—(alpha, beta, gamma)	2	7	Observation and ergonomic assessment of activities in accordance with applicable company policies and procedures, and ACGIH threshold limit value.
	Chemical constituents—organic vapors, lead, cadmium	3, 4		
	Hazardous noise	6	8	Heat stress—wet-bulb globe temperature, body weight, fluid intake.  Cold stress—ambient air temperature, wind chill charts.
	Ergonomics, repetitive motion, lifting	7		
	Heat and cold stress	8		
a. Monitoring and sampling will be conducted as deemed appropriate by project IH and RadCon personnel based on specific tasks and site conditions. b. Equivalent instrumentation other than those listed may be used.				

Table 4-2. Action levels and associated responses for the Snake River Plain Aquifer Project hazards.

Contaminant/Agent Monitored	Action Level	Response Taken if Action Levels are Exceeded
Nuisance particulates (not otherwise classified)	>10 mg/m <sup>3</sup> (inhalable fraction) >3 mg/m <sup>3</sup> (respirable fraction)	Move personnel to upwind position of source and close equipment cab windows and doors. Use wetting or misting methods to minimize dust and particulate matter. <u>IF</u> wetting or misting methods prove ineffective, <u>THEN</u> don respiratory protection <sup>a</sup> (as directed by industrial hygienist).
Hazardous atmosphere	As defined by applicable company policies and procedures or based on one-half or 50% of the individual contaminant exposure limit, lower explosive limit (LEL), oxygen content, etc.	<ol style="list-style-type: none"> <li>1. Measure atmosphere prior to initiating operation or personnel entry and verify specific limit or condition has been met (e.g., &lt;LEL).</li> <li>2. Utilize engineering controls to maintain safe atmosphere/below specified limit.</li> <li>3. <u>IF</u> engineering control fails to control contaminant below safe atmospheric/exposure limit, <u>THEN</u> stop operation and evacuate personnel until safe atmosphere/specified limit can be achieved.</li> </ol>
Silica (respirable fraction)	Greater than or equal to the OSHA permissible exposure limit of $\frac{10 \text{ mg/m}^3}{\% \text{silica} + 2}$ (29 CFR 1910.1000 [Z31])	Move personnel to upwind position of source. Use wetting or misting methods to minimize dust and particulate matter during mixing. <u>IF</u> wetting or misting methods prove ineffective, <u>THEN</u> don respiratory protection <sup>a</sup> (as directed by industrial hygienist).
Hazardous noise levels	<85 dBA 8-hour TWA, <83 dBA 10-hour TWA	No action.
	85 to 114 dBA	Hearing protection required to attenuate hazard to below 85 dBA 8-hour TWA or 83 dBA for 10-hour TWA (device noise reduction rating [NRR]).
Radiation field	(a) >115 dBA	(a) Isolate source, evaluate NRR for single device, double protection as needed.
	(b) >140 dBA	(b) Control entry, isolate source, only approved double protection worn.
	<5 mrem/hour	No action, no posting required.
Radionuclide contamination	5 to 100 mrem/hour @ 30 cm (10 CFR 835.603.b)	Post as "Radiation Area"—Required items: Radiological Worker I or II training, radiological work permit (RWP), personal dosimetry.
	>100 mrem to 500 Rad @ 100 cm (10 CFR 835.603.b)	Post as "High Radiation Area"—Required items: RW II, RWP, alarming personal dosimetry, dose rate meter, and temporary shielding (as required).
	1 to 100 times company determined limits <sup>b</sup> (10 CFR 835.603.d)	Post as "Contamination Area"—Required items: RW II training, personal dosimetry, RWP, don PPE, bioassay submittal (as required).

Table 4-2. (continued).

Contaminant/Agent Monitored	Action Level	Response Taken if Action Levels are Exceeded
	>100 x company determined limits <sup>b</sup> (10 CFR 835.603.d)	Post as “High Contamination Area” —Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required).
Airborne radioactivity	Concentrations (μCi/cc) >30% of and derived air concentration value (10 CFR 835.603.d)	Post as “Airborne Radioactivity Area” —Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required).
<p>a. Level C respiratory protection will consist of a full-face respirator equipped with a high-efficiency particulate air filter cartridge as prescribed by the project IH and RadCon personnel (based on contaminant of concern). See Section 5 for additional Level C requirements.</p> <p>b. The project radiological engineer and/or the RCT will define company limits.</p>		

Various direct-reading instruments may be used to determine the presence of nonradiological and other physical agents. The frequency and type of sampling and monitoring will be determined by changing site conditions, direct-reading instrument results, observation, professional judgment, and in accordance with the applicable company policies and procedures.

All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations, existing industrial hygiene protocol, and in conformance with the companywide safety and health manuals. Direct reading instruments will be calibrated, at a minimum, before daily use and more frequently as determined by the project industrial hygienist. Calibration information, sampling and monitoring data, results from direct-reading instruments, and field observations will be recorded as stated in Section 13.

#### **4.3.2 Area Radiological Monitoring and Instrument Calibration**

Area radiological monitoring will be conducted during project tasks to ensure that personnel are given adequate protection from potential radiological exposure. Instruments and sampling methods listed in Table 4-1 may be used by the RCT as deemed appropriate and as required by project or task-specific RWPs. When conducted, monitoring will be performed in accordance with applicable company manuals. The data obtained from monitoring will be used by RadCon personnel to evaluate the effectiveness of engineering controls, decontamination methods and procedures, and alert personnel to potential radiation sources.

RadCon personnel will use radiation and contamination detectors and counters listed in Table 4-1 or equivalent instruments to provide radiological information to personnel. Daily operational and source checks will be performed on all portable survey instruments used on this project to ensure they are within the specified baseline calibration limits. Accountable radioactive sources will be maintained in accordance with applicable company policies and procedures. All radiological survey and monitoring equipment will be maintained and calibrated in accordance with the manufacturer's recommendations, existing RadCon protocol, and in conformance with applicable company policies and procedures.

**4.3.2.1 External Dosimetry.** Dosimetry requirements will be based on the radiation exposure potential during project tasks. When dosimetry is required, all personnel who enter the project area will be required to wear personal dosimetry devices, as specified by RadCon personnel and the RWP, and in accordance with the applicable company manuals.

When RWPs are required for project tasks, the Radiological Control and Information Management System (RCIMS) will be used to track external radiation exposures to personnel. Individuals are responsible for ensuring all required personal information is provided to RadCon personnel for entry into RCIMS and logging into RCIMS when electronic dosimeters are used.

**4.3.2.2 Internal Monitoring.** The purpose of internal dose monitoring is to demonstrate the effectiveness of contamination control practices and to document the nature and extent of any internal uptakes that may occur. Internal dose evaluation programs will be adequate to demonstrate compliance with 10 CFR 835, "Occupational Radiation Protection." The requirement for whole body counts and bioassays will be based on specific project tasks or activities and will be the determination of the radiological engineer. Bioassay requirements will be specified on the RWP and project personnel will be responsible for submitting required bioassay samples upon request.

## 5. ACCIDENT AND EXPOSURE PREVENTION

Project activities will present numerous safety, physical, chemical, and radiological hazards to personnel conducting these tasks. It is critical that all personnel understand and follow the site-specific requirements of this HASP. Engineering controls, hazard isolation, specialized work practices, and the use of PPE will be implemented to eliminate or mitigate potential hazards and exposures, where feasible. However, all personnel are responsible for the identification and control of work area hazards in accordance with Integrated Safety Management System (ISMS) principals and practices. **At no time will hazards be left unmitigated without implementing some manner of controls (e.g., engineering controls, administrative controls, or the use of PPE).** Project personnel shall use stop work authority in accordance with applicable company policies and procedures where it is perceived that immanent danger to personnel, equipment, or the environment exists.

This HASP is to be used in conjunction with applicable company policies and procedures. Where appropriate, applicable company policies and procedures, mitigation guidance, JSAs, and RWP's will be incorporated into applicable sections of the HASP.

### 5.1 Voluntary Protection Program and Integrated Safety Management

The INEEL safety processes embrace the Voluntary Protection Program (VPP) and ISMS criteria, principles, and concepts to identify and mitigate hazards, thereby preventing accidents. All management and workers are responsible for implementing safety policies and programs and for maintaining a safe and healthful work environment. Project personnel are expected to take a proactive role in preventing accidents, ensuring safe working conditions for themselves and fellow personnel, and complying with all work control documents, procedures, and permits.

The **ISMS** is focused on the **system** side of conducting operations and **VPP** concentrates on the **people** aspect of conducting work. Both programs define work scope, identify and analyze hazards, and mitigate the hazards and additional information on these programs is available on the INEEL Intranet. BBWI (current primary management and operating contractor) and its subcontractors participate in VPP and ISMS for the safety of their employees. This document includes all elements of both systems. The five key elements of VPP and ISMS and their corresponding HASP sections are as follows:

VPP	ISMS	HASP Section
	Define work scope	Section 2
Work site analysis	Analyze hazards	Section 3, 4, 6, 8,
Hazard prevention and control	Develop and implement controls	Section 3, 4, 5, 7, 8, 10, 11, 12
Safety and health training	Perform within work controls	Section 7
Employee involvement	Perform work within controls	Section 3, 4, 5
Management leadership	Provide feedback and improvement	Section 5, 10

## 5.2 General Safe-Work Practices

Sections 1 and 2 defined the project work scope and associated project-specific hazards with mitigation. The following practices are mandatory for all project personnel to further reduce the likelihood of accidents and injuries. All visitors permitted to enter work areas must follow these requirements. Failure to follow these practices may result in permanent removal from the project and other disciplinary actions. The project FTL and HSO will be responsible for ensuring the following safe-work practices are adhered to at the project site(s):

- Limit work area access to authorized personnel only, in accordance with applicable company policies and procedures and Section 7 of this document.
- All personnel have the authority to initiate STOP WORK actions in accordance with applicable company policies and procedures.
- Personnel will not eat, drink, chew gum or tobacco, smoke, apply sunscreen, or perform any other practice in CERCLA areas or in areas where there is an increased probability of hand-to-mouth transfer and ingestion of work areas contaminants.
- Be aware of and comply with all safety signs, tags, barriers, and color codes as identified in accordance with applicable company policies and procedures.
- Be alert for dangerous situations, strong or irritating odors, airborne dusts or vapors, and spills that may be present. Report all potentially dangerous situations to the FTL or HSO.
- Avoid direct contact with hazardous materials and waste. Personnel will not walk through spills or other contamination areas and will avoid kneeling, leaning, or sitting on equipment or potentially contaminated surfaces.
- Be familiar with the physical characteristics of the INTEC Facility, including, but not limited to:
  - Prevailing wind direction
  - Location of fellow personnel, equipment, and vehicles
  - Communications at the project site and with INTEC or CFA
  - Area and the type of hazardous materials stored and waste disposal materials
  - Major roads and means of access to and from the project site
  - Location of emergency equipment
  - Warning devices and alarms at INTEC and/or CFA
  - Capabilities and location of nearest emergency assistance.

- Report all broken skin or open wounds to the operations manager, FTL, or HSO. An OMP physician must examine all wounds to determine the nature and extent of the injury. If required to enter into a radiological contamination area, a RadCon supervisor will determine whether the wound can be bandaged adequately in accordance with applicable company manuals.
- Prevent releases of hazardous materials. If a spill occurs, personnel must try to isolate the source (if possible and if this does not create a greater exposure potential) and then report it to the FTL, or HSO. The Warning Communications Center (WCC) and INTEC shift supervisor will be notified and additional actions will be taken, as described in Section 11. Appropriate spill response kits or other containment and absorbent materials will be maintained at the project site.
- Illumination levels during project tasks will be in accordance with 29 CFR 1910.120 (Table H-120.1, “Minimum Illumination Intensities in Foot-Candles”).
- Ground-fault protection will be provided whenever electrical equipment is used outdoors.
- Keep all ignition sources at least 15 m (50 ft) from explosive or flammable environments and use nonsparking, explosion-proof equipment when working on systems containing flammable or explosive liquids, gases, and vapors.
- Follow all safety and radiological precautions and limitation of TPRs and requirements identified in work packages.

### 5.3 Subcontractor Responsibilities

Subcontractors are responsible for meeting all applicable requirements listed in the completed, applicable company forms, policies, and procedures as well as manuals, and contract general and special conditions. Additionally, subcontractor are expected to take a proactive role in hazard identification and mitigation while conducting project tasks and report unmitigated hazards to the project point of contact and HSO after taking mitigative actions within the documented work controls.

### 5.4 Radiological and Chemical Exposure Prevention

Exposure to potential chemical, radiological, and physical hazards will be mitigated by using of engineering controls, administrative controls, and PPE as a last means of defense to prevent and minimize exposure where engineering controls are not feasible. All project personnel are responsible for understanding the hazard identification and mitigation measures necessary to prevent exposures.

#### 5.4.1 Radiological Exposure Prevention – As Low as Reasonably Achievable Principles

Radiation exposure of project personnel will be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit. **Unplanned and preventable exposures are considered unacceptable.** All project tasks will be evaluated with the goal of eliminating or minimizing exposures. All project personnel have the responsibility for following as-low-as-reasonably-achievable (ALARA) principles and practices and personnel working at the site must strive to keep both external and internal radiation doses.

## 5.4.2 Chemical and Physical Hazard Exposure Avoidance

**NOTE:** Identification and control of exposures to carcinogens will be conducted in accordance with applicable company policies and procedures.

TLVs or other occupation exposure limits have been established for numerous chemicals and physical agents (e.g., noise, heat, or cold stress) that may be encountered. These exposure limits provide guidelines in evaluating airborne, skin, and physical agent exposures. The TLVs represent levels and conditions under which it is believed that nearly all workers may be exposed day after day without adverse health effects. The TLV-TWA is a time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects. Action limits (instantaneous concentrations for short time periods) have been established (Section 3) to further reduce the likelihood of exceeding TLVs.

Controls will be employed to eliminate or mitigate chemical and physical hazards wherever feasible. The hierarchy of controls in order are (1) engineering controls, (2) administrative controls, and (3) PPE. In addition to these controls, use of technical procedures and work orders, hold points, training, and monitoring of hazards will be used as appropriate to reduce exposure potential. Some methods of exposure avoidance include:

- Wearing all required PPE, inspecting all pieces before donning, and taping all seams
- Changing PPE if it becomes damaged or shows signs of degrading
- Minimizing time in direct contact with both hazardous material and waste
- Doff PPE following standard practices (i.e., rolling outer surfaces in and down) and follow doffing sequence
- Wash hands and face before eating, drinking, smoking, or engaging in activities that may provide contaminant pathways.

## 5.5 Buddy System

The two-person or buddy system will be used during project tasks. The buddy system is most often used during project activities requiring the use of protective clothing and respiratory protection where heat stress and other hazards may impede a person's ability to self-rescue. The buddy system requires each employee to assess and monitor his or her buddy's mental and physical well being during the course of the operation. A buddy must be able to perform the following activities:

- Provide assistance if required
- Verify the integrity of PPE
- Observe his or her buddy for signs and symptoms of heat stress, cold stress, or contaminant exposure
- Notify other personnel in the area if emergency assistance is needed.

The buddy system will be administered by the FTL in conjunction with the HSO.